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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/776,228

02/12/2004

Je Won Kim

2336-241

2636

7590

10/05/2006

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EXAMINER

MULPURI, SAVITRI

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 10/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.		Applicant(s)	
	10/776,228		KIM ET AL.	
	Examiner		Art Unit	
	Savitri Mulpuri		2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 2812

DETAILED ACTION

This action is in response to the applicant's communication Affidavits and arguments filed on 7/10/2006.

Response to Arguments

Applicant's arguments filed 7/10/2006 have been fully considered but they are not persuasive. Applicant argues that Toshiba et al teaches annealing the process performed on doped GaN ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-5, 7-15, 17-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al (US 6,673,702) in combination with Nakamura et al (US 5,578,839) and Matsukoa (US 6,586,819)

Orita et al teaches growing GaN buffer layer on either sapphire substrate; treating the buffer layer in hydrogen atmosphere or hydrogen gas mixed with other gases in MOCVD, at temperature of 500- 900 °C, to remove oxide layer (see col. 4, lines 39-47; col. 7, lines 1-30); successively growing first GaN based layer, active GaN based layer and second GaN based layer on the buffer layer (see 7C). Orita et al also teaches growing first active and second GaN based layers in MOVPE or HVPE.

Art Unit: 2812

Though Orita et al teaches both HVPE and MOCVD for both buffer layer and active layers, Orita et al does not teach specifically which layer is grown by what technique. However, it is well known that HVPE give fast growth rate with low quality GaN layer and MOCVD give low growth rate and high quality and it is obvious to one of the ordinary skill in the art to grow buffer layer in HVPE at fast growth to get thick buffer layer and active layer in MOCVD with slow growth rate and thin layers for light emission. Using thick layer is essential as buffer layer because thick layer are useful not to cause any defects in the subsequent device layers.

Orita et al do not teach forming buffer layer being undoped buffer layer. Nakamura et al teaches GaN based undoped buffer layer on the substrate and then successively growing lower clad layer "16" and active layer "16" and upper clad layer "20" on the undoped buffer layer "14" (see fig 1 and col. 5, lines 65-67, col. 6, lines 5-21). It would have been obvious to one of ordinary skill in the art to form undoped buffer layer in the invention of Orita et al because undoped buffer layer can be useful as insulating layer between the active layer by providing good isolation, and undoped buffer layer can would not have problem out diffusion of the dopants into the active layer because the buffer layer is undoped buffer layer.

Orita et al do not additionally teach heat-treating step. Matsuoka teaches annealing the GaN layer by increasing temperature to 10 50 C in gas mixture ammonia and nitrogen to form crystalline buffer layer(col6, lines 60-64)). It would have been obvious to one of ordinary skill in the art to perform heat treatment of the GaN layers, in nitrogen atmosphere, in the invention of Orita et al because heat treatment for the

Art Unit: 2812

benefit of improving the crystalline quality and also smooth surface by replenishing the loss of nitrogen, which inherently happens in the invention of Orita et al during the high temperature treatment step for removing oxygen. It is well known that high temperature treatment depletes the nitrogen from the surface nitride semiconductor layer. and Matsukoa (US 6,586,819) . With respect to claim 20 of narrow temrature range, generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. "[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235(CCPA 1955)

Claims 6, 16 rejected under 35 U.S.C. 103(a) as being unpatentable over orita et al in combination with Nakamura et al and Matsukoa (US 6,586,819) as applied to claims 2-5,7-15,17-21 above, and further in view of Lee et al.

Orita et al doe not teach nitridation of the substrate. Lee teaches nitridation of the substrate. It would have been obvious to one of ordinary skill in the art to perform nitradation on the substrate prior to growing GaN based layer because such nitridation gives high quality nitride based semiconductor layers.

Applicant's arguments with respect to claims 2-21 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 2812

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-FRi from 8 a.m. to 4.30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Savitri Mulpuri
Primary Examiner
Art Unit 2812